

EV Charging Station *Maintenance Manual* Ed.02



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EV Charging Station

Maintenance Manual Ed.02

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1. Safety and Compliance

This document provides instructions to properly maintain and service the DuraStation products included in section 3.2. Catalogue data.

Once installing the DuraStation, you should review this manual carefully and consult with a licensed contractor, licensed electrician, and trained installation expert to insure compliance with local building codes, climate conditions, safety standards and wiring regulations.

Only a licensed contractor, and a licensed electrician in accordance with all local and national codes and standards should perform the maintenance of the DuraStation.

Under no circumstances will compliance with the information in this maintenance manual relieve the user of his/her responsibility to comply with all applicable codes, safety standards or wiring regulation.

Intent of this service manual is to lend a hand to maintenance personnel in diagnosing and repairing filed units; and also, to assist in establishing when a suspicious behavior is not a failure.

2. Definition and Terms

- EV: Electrical Vehicle
- EVSE: Electric Vehicle Supply Equipment
- EV Charging station = Charging station = EVSE
- PE: Protective Earth

3. Technical Data

DuraStation has a list of basic features that are upgradeable, resulting in a robust and reliable solution for the need of EV charging infrastructure.

- The socket satisfies mode 3 charging standards, and is optionally equipped with an electromechanical interlock.
- LED light to display charger status:
Green= Station active
Blinking Green= Vehicle connected, but not charging
Amber= Charging
Red= Fault occurred
- Option for a Radio Frequency Identification (RFID) reader:
users will gain charging authorization by swiping RFID cards in front of the readers.
- Ethernet network offered for RFID authorization service.
- RFID software application registers usage of the EVSE enabling data collection and will also monitor status of communication between RFID and DuraStation.
- Residual current protection and auto re-closure.
- Vehicle ground monitoring circuit.
- Single phase metering.

3.1. Technical Characteristics

IEC Compliant	Mode 3 per IEC 61851
Vehicle Interface	Type 2 connector per IEC 62196
Voltage and Current Rating	230VAC at 16A or 400VAC at 32A
AC Max. Charging Power Output**	22kW (400VAC at 32A) 3.6kW (230VAC at 16A)
AC Power Input	230VAC requiring only L1, N, and PE 400VAC requiring only L1, L2, L3, N and PE
Recommended Panel Breaker	Compact pedestal, Pole, Wall: 1x4-pole 40A , or 2-pole 20A breaker on dedicated circuit Back-to-back pedestal: 2x4-pole 40A, or 2-pole 20A breaker on dedicated circuit
Ground Fault Protection	Internal 30mA RCD with auto re-closure
Cold Load Start	Random start up between 0 and 15 minutes for peak protection
Local Area Network	CAT5 Ethernet
Network Communication Protocol	TCP/IP
RFID Reader	ISO15693 and ISO14443 compliant
Standby Power	5W typical
Outdoor Rated	Enclosure IP54-IP65, socket outlet IP44
Safety Compliance	IEC 61851 and IEC 62196 compliant CE Marking Certification Low Voltage (2006/95/EG) and EMC Directive (2004/108EC).
Resistance against surges	IEC 61851 compliant
EMI Compliance	IEC 61851 compliant
Operating Temperature	-30°C to +50°C ambient
Operating Humidity	Up to 95% non-condensing
Approximate Shipping Weights	Compact pedestal: 30kg Back-to-back pedestal: 45kg Pole: 25kg Wall: 25kg
Dimensions HxWxD (in mm)	Compact pedestal: 1300 x 275 x 200 Back-to-back pedestal: 1300 x 350 x 300 Pole: 800 x 237 x 200 Wall: 800 x 237 x 200

** The maximum available power consumption is determined by the DuraStation. The actual power consumption is determined by the EV.



3.2. Catalogue data

3.2.1. TN-S distribution system

For use in electrical distribution systems of type TN-S, the following products are available:

Cat No.	Ref. No.	Type	Max. Output	No. of Sockets	RFID	Integrated Meter
EVSP16A1P1N	450100	Pedestal	230V 16A 1 phase	1	N	Single phase
EVSP32A3P1N	450101	Pedestal	400V 32A 3 phase	1	N	Singe phase
EVSP16A1P2N	450102	Pedestal	230V 16A 1 phase	2	N	Single phase
EVSP32A3P2N	450103	Pedestal	400V 32A 3 phase	2	N	Single phase
EVSP16A1P1R	450104	Pedestal	230V 16A 1 phase	1	Y	Single phase
EVSP32A3P1R	450105	Pedestal	400V 32A 3 phase	1	Y	Single phase
EVSP16A1P2R	450106	Pedestal	230V 16A 1 phase	2	Y	Single phase
EVSP32A3P2R	450107	Pedestal	400V 32A 3 phase	2	Y	Single phase
EVSW16A1P1N	450108	Wall	230V 16A 1 phase	1	N	Single phase
EVSW32A3P1N	450109	Wall	400V 32A 3 phase	1	N	Single phase
EVSW16A1P1R	450110	Wall	230V 16A 1 phase	1	Y	Single phase
EVSW32A3P1R	450111	Wall	400V 32A 3 phase	1	Y	Single phase
EVSP16A1P1N	450112	Pole	230V 16A 1 phase	1	N	Single phase
EVSP32A3P1N	450113	Pole	400V 32A 3 phase	1	N	Single phase
EVSP16A1P1R	450114	Pole	230V 16A 1 phase	1	Y	Single phase
EVSP32A3P1R	450115	Pole	400V 32A 3 phase	1	Y	Single phase

3.2.2. TN-S with surge arrestor

In certain electrical systems the DuraStation power circuit has to include an impulse surge arrestor device to comply with the local regulations or the conditions of the application. See products below for this requirement:

Cat No.	Ref. No.	Type	Max. Output	No. of Sockets	RFID	Integrated Meter
EVSP16A1P1N-SA	450131	Pedestal	230V 16A 1 phase	1	N	Single phase
EVSP32A3P1N-SA	450133	Pedestal	400V 32A 3 phase	1	N	Singe phase
EVSP16A1P2N-SA	450139	Pedestal	230V 16A 1 phase	2	N	Single phase
EVSP32A3P2N-SA	450141	Pedestal	400V 32A 3 phase	2	N	Single phase
EVSP16A1P1R-SA	450132	Pedestal	230V 16A 1 phase	1	Y	Single phase
EVSP32A3P1R-SA	450134	Pedestal	400V 32A 3 phase	1	Y	Single phase
EVSP16A1P2R-SA	450140	Pedestal	230V 16A 1 phase	2	Y	Single phase
EVSP32A3P2R-SA	450142	Pedestal	400V 32A 3 phase	2	Y	Single phase
EVSW16A1P1N-SA	450135	Wall	230V 16A 1 phase	1	N	Single phase
EVSW32A3P1N-SA	450137	Wall	400V 32A 3 phase	1	N	Single phase
EVSW16A1P1R-SA	450136	Wall	230V 16A 1 phase	1	Y	Single phase
EVSW32A3P1R-SA	450138	Wall	400V 32A 3 phase	1	Y	Single phase

3.2.3. TN-C distribution system

In TN-C electrical distribution systems, the following DuraStation products are considered:

Cat No.	Ref. No.	Type	Max. Output	No. of Sockets	RFID	Integrated Meter
EVSP16A1P1N-NC	450143	Pedestal	230V 16A 1 phase	1	N	Single phase
EVSP32A3P1N-NC	450145	Pedestal	400V 32A 3 phase	1	N	Singe phase
EVSP16A1P2N-NC	450151	Pedestal	230V 16A 1 phase	2	N	Single phase
EVSP32A3P2N-NC	450153	Pedestal	400V 32A 3 phase	2	N	Single phase
EVSP16A1P1R-NC	450144	Pedestal	230V 16A 1 phase	1	Y	Single phase
EVSP32A3P1R-NC	450146	Pedestal	400V 32A 3 phase	1	Y	Single phase
EVSP16A1P2R-NC	450152	Pedestal	230V 16A 1 phase	2	Y	Single phase
EVSP32A3P2R-NC	450154	Pedestal	400V 32A 3 phase	2	Y	Single phase
EVSW16A1P1N-NC	450147	Wall	230V 16A 1 phase	1	N	Single phase
EVSW32A3P1N-NC	450149	Wall	400V 32A 3 phase	1	N	Single phase
EVSW16A1P1R-NC	450148	Wall	230V 16A 1 phase	1	Y	Single phase
EVSW32A3P1R-NC	450150	Wall	400V 32A 3 phase	1	Y	Single phase



CAUTION: In TN-C Networks, ensure that all earth connections are the same point, and also neutral and earth functions are combined. Refer to "Installation Instruction" manual for more details about wiring and distribution systems.



3.3. Torque specification

Size	Recommended Torque (N.m)
LED	
M3	0.5
M5	2.1
RFID reader	
M4	1.2
Connector (recommended by supplier Mennekes)	
M4	1.2
M5	1.4

3.4. Tools

Type	Characteristics
Screwdriver	Used in wiring connections
Hexagonal key	Socket size: 19mm
Wire stripper	

3.5. Contact blocks

Type range	Size	1 Single wire (solid) (min-max) mm ²	1 Single wire (semi-solid) (min-max) mm ²	2 Single wires (semi-solid) (min-max) mm ²	1 Stranded (flexible) (min-max) mm ²	2 Stranded (flexible) (min-max) mm ²	Rated conductor cross-section
RK 35 (Phases)	M6	2.5-16	2.5-50	16-16	2.5-35	2.5-16	35
SL 35 (Earthing)	M6	2.5-16	2.5-50	16-16	2.5-35	2.5-16	35



WARNING: De-energize equipment before performing any work on the installation. Make sure that the main breaker of the DuraStation is locked out, as well as the upstream breaker in the distribution panel. (This is achieved with accessory KS 644929 in both cases)

4. System Description

Maintenance for the charging station is divided into the following sub-systems:

4.1. Enclosure

The surrounding case provides protection to personnel against incidental contact with the enclosed equipment or parts that involve risk. It also provides a degree of protection to the enclosed equipment against specified environmental conditions or reduces the risk of propagation of flame, sparks, and molten metal initiated by an electrical disturbance occurring within.

The following devices are contained within the enclosure:

- LED: User interface
- Socket
- RFID: User identification system
- Maintenance door

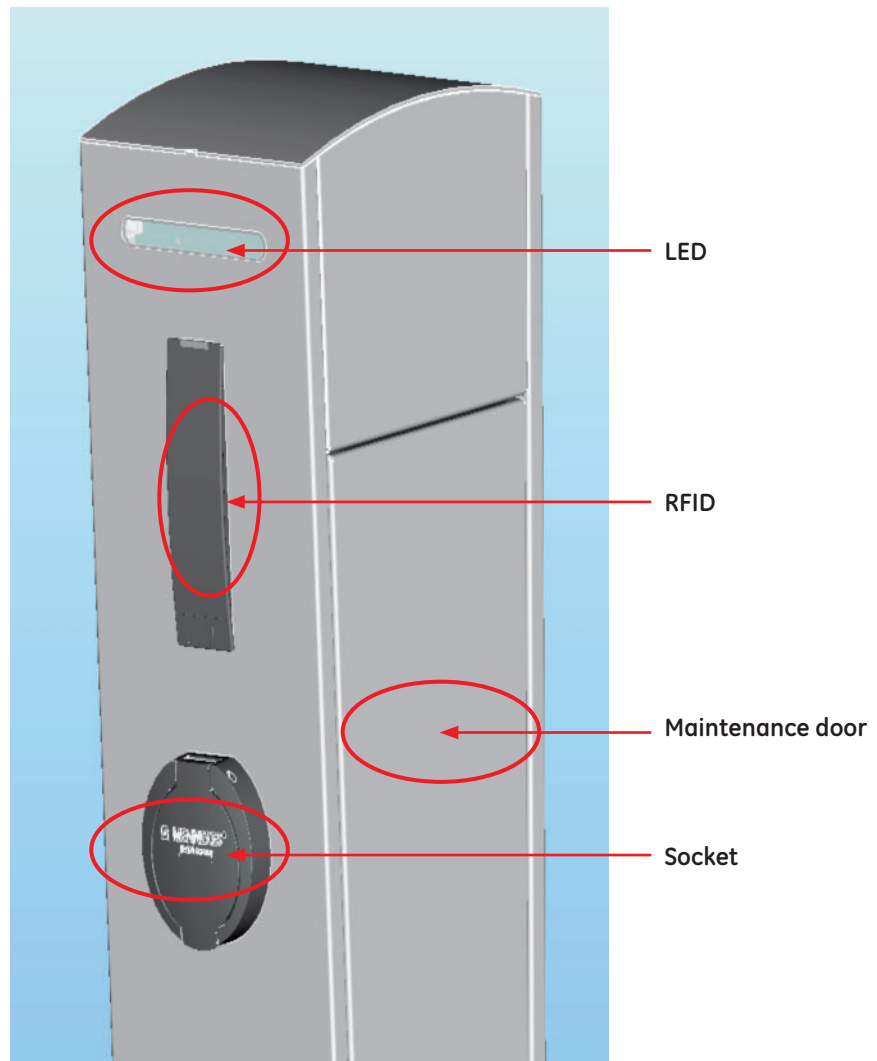


Figure 1: Enclosure

4.2. Power Circuit

Group of devices arranged in such a way that will protect the system from overcurrents, short-circuits, electric shock, reinforcing insulation or conducting potential fault and residual currents to earthed point.

- Contactor
- MCB (Miniature Circuit Breaker)
- RCD (Residual Current Device; earth leakage detection)
- Tele MP (reconnection device)

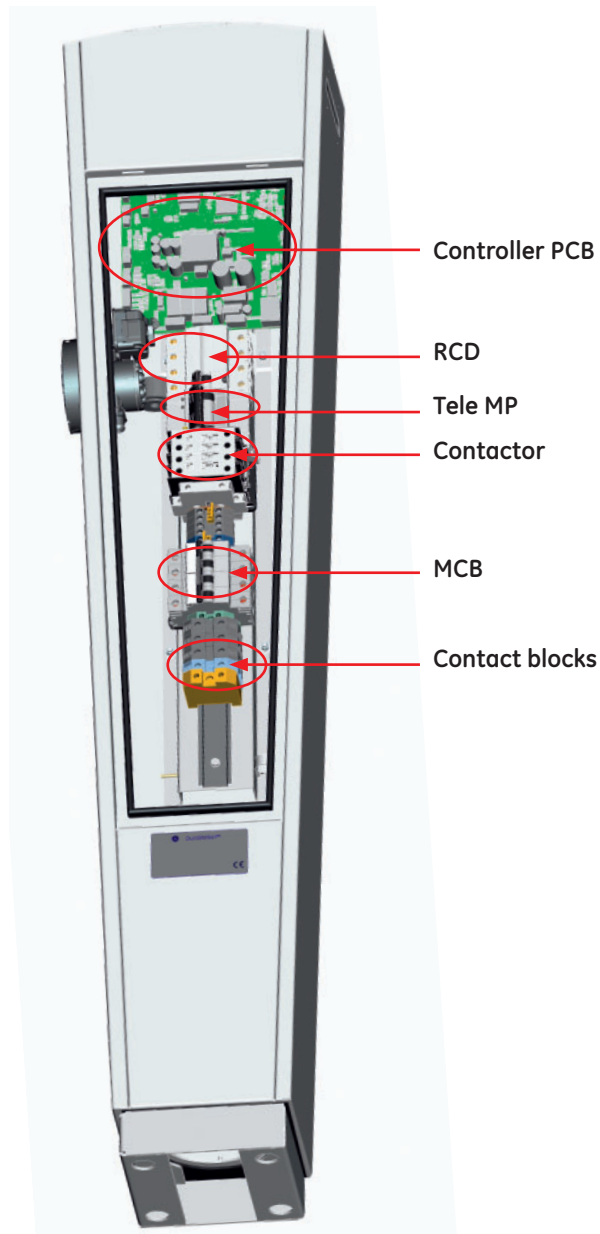


Figure 2: Power Circuit

4.3. Network management

Keeps track of resources in the network, how they are assigned and their availability so as to provide users with a more efficient charging process. Refer to "Installation Instructions" manual for more details.

5. General Operations & Safety Requirements



Before Inspection or any maintenance work is done, be sure that all electrical power is disconnected. Make sure that the main breaker of the DuraStation is locked out, as well as the upstream breaker in the distribution panel. (This is achieved with accessory KS 644929 in both cases)

5.1. General Maintenance Requirements

Periodic maintenance must be established in order to obtain the best service from the EVSE charger.

An annual check of the switchgear devices and all connections should be the minimum requirement.

Equipment subject to highly repetitive operation may require more frequent maintenance.

A permanent record of all maintenance work should be kept. The record should include a list of periodic checks and tests made, the date they were made, the condition of the equipment, and any repairs or adjustments that were performed.

Maintenance employees must follow all recognized safety practices, such as those contained in the National Electric Safety Code and in company or other safety regulations.

For specific information regarding the maintenance of devices, such as circuit breakers, RCD, relays, meters, etc.. refer to the separate instruction book provided for each device.

5.2. Enclosure Maintenance Requirements

The enclosure station requires no maintenance other than occasional cleaning.



Warning: To reduce the risk of electrical shock or equipment damage, do not allow opening the unit while cleaning it. Enclosure maintenance is performed only externally.

Clean the enclosure using a soft cloth lightly moistened with mild detergent solution.

Never use any type of abrasive pad, scouring powder, or flammable solvents such as alcohol or benzene.

5.3. Power Circuit Maintenance Requirements

Inspection of the power circuit is recommended at least once a month.

More frequent inspections are recommended, if several load conditions, dust, moisture, or other unfavourable conditions exist.

• MCB, RCD, Tele MP

If the breaker remains open or closed for a long period of time, it is recommended that arrangements be made to open and close it several times in succession, preferably under load.

At all times, it is important not to permit paint, oil or other foreign materials to remain on the insulating surfaces or the breaker as they may cause low resistance between points of different potential and result in eventual electrical breakdown.

Always inspect the devices after a short circuit current has been interrupted.

Normally, the over current protective device on the circuit will prevent any electrical damage except at the actual point of the short circuit.

A thorough inspection of the entire system must be made after any large fault current to insure that there has been no mechanical damage to conductors, insulation, or equipment.

Do not open sealed devices such as breaker trip units. If there is any possibility that sealed units may have been damaged, they should be replaced.

At the time of inspection, the following checks should be made after the device has been de-energized.

- Manually operate the device several times checking for obstructions or excessive friction.
- Electrically operate the device several times (if breaker has electrical control) to ascertain whether the electrical attachments are functioning properly.
- Break-age of parts or extensive burning will indicate need for replacement.
- Check operation of tripping devices, including over current trip devices, making sure all have positive tripping action. (Discernible movement in tripping direction beyond point of tripping).
- Push test-button in the RCD device: positive tripping action (ensure RCD device is powered, therefor the contactor should be closed manually).

• Contactor

Ensure a trouble free operation of the contactor until the next service is required.

As in the previous devices, always inspect the device after main breaker tripping.

At the same time, observations can be made to judge if the contactor operates well in the application.

Ensure that electrical continuity in all the poles is retained and should be operable in ON/trip/rest sequence manually. If there is any possibility the unit has been damaged, it should be replaced.

For additional details on the particular device, refer to the applicable instruction manual provided with the device.

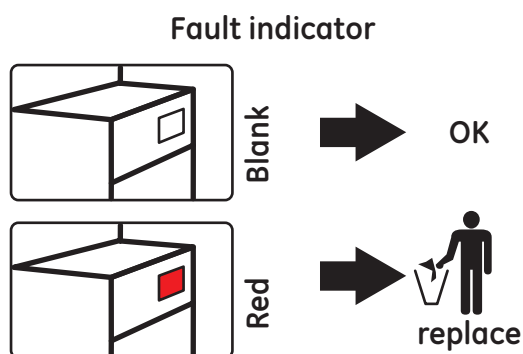


- **Impulse Surge Arrester** (Refer to section 3.2.2)

The surge arresters do not contain wearing parts and therefore, they are maintenance free. Replacement parts are not needed.

Maintenance is based into a visual inspection of the following parts:

- Check that the arrester housing is clean and free from where is installed.
- The monitoring device for leakage current (Fault indicator) is reviewed as it is indicated.



It is recommended to replace the units that caused the mechanical defect of the surge arrester.

5.4. Cable Maintenance Requirements

Inspect and check the cables as follows:

- Inspect all power cable connections for signs of overheating and tighten all connections.
- If severe discoloration or if damage is apparent, remove the damaged cable and replace any device with damaged terminal.



CAUTION: Be sure the condition which caused the over heating has been corrected before reenergizing.

- Check the neutral bus and earth bus connection and mounting bolts for tightness.
- Check that all wiring connections are tight and all control cabling is intact.

5.5. Gaskets Maintenance Requirements

Gaskets require regular maintenance to prevent mold and mildew and to maintain the elasticity of the seal. Visually check the different gaskets or lid for tears or punctures. Leaks are indicated by a streak of frost that forms at the point of gasket failure.

Gasket and retainer groove cleaning can be accomplished with the use of warm soapy water and a soft bristle brush.



CAUTION: Avoid full strength cleaning products on gaskets as this can cause them to become brittle and prevent proper sealing. Never use sharp tools or knives to scrape or clean the gasket. This could tear the gaskets.

6. Replacing Components



Before Inspection or any maintenance work is done, be sure that all electrical power is disconnected. Make sure that the main breaker of the DuraStation is locked out, as well as the upstream breaker in the distribution panel. (This is achieved with accessory KS 644929 in both cases)

6.1. Controller PCB

Turn circuit breaker off, verifying no power is applied. Open the enclosure door with its corresponding key. Remove the door carefully for improved access.

The different connectors included in the controller are disconnected.
(See connectors in blue in following picture)

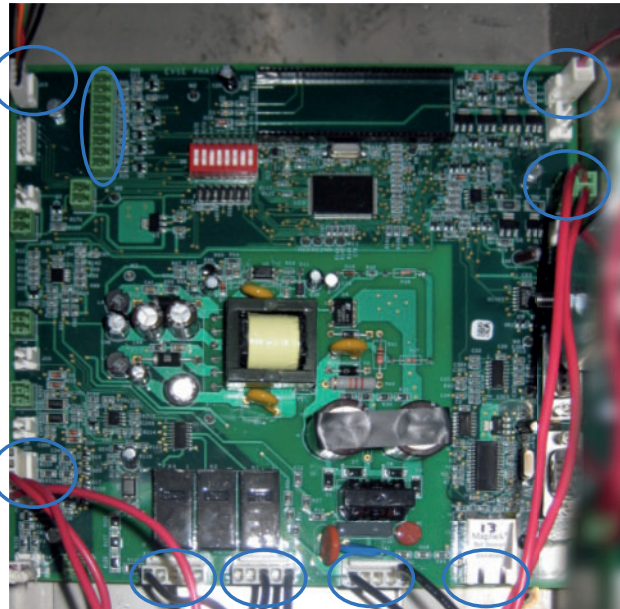


Figure 3: Controller PCB

The four click supports that hold the controller are removed by pressing them. The broken PCB needs to be replaced by the new one.

The new PCB is fixed to the enclosure in the same way, and all the connectors are installed again.

Note: DuraStation charger configuration will be necessary for this new PCB. Please, follow the described steps in the provided "Charging Station Installation Instructions" manual.

6.2. Socket

Turn the circuit breaker off, verifying no power is applied. Open the enclosure door with its corresponding key. Remove the door carefully for improved access.

Uninstall the connector from the enclosure as is indicated:

1. Inside the enclosure, remove the interlock part from the connector (for this, unscrew the two screws as indicated in pictures below).



Figure 4: Removing interlock - STEP 1: unscrew



Figure 4: Removing interlock - STEP 2: remove

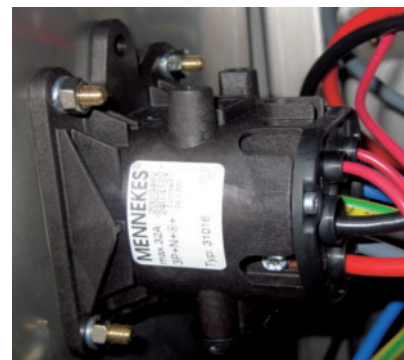


Figure 5: Connector without interlock

2. Then, unscrew the four screws that hold the socket in the enclosure. (See the following picture to distinguish the different parts of the connector).

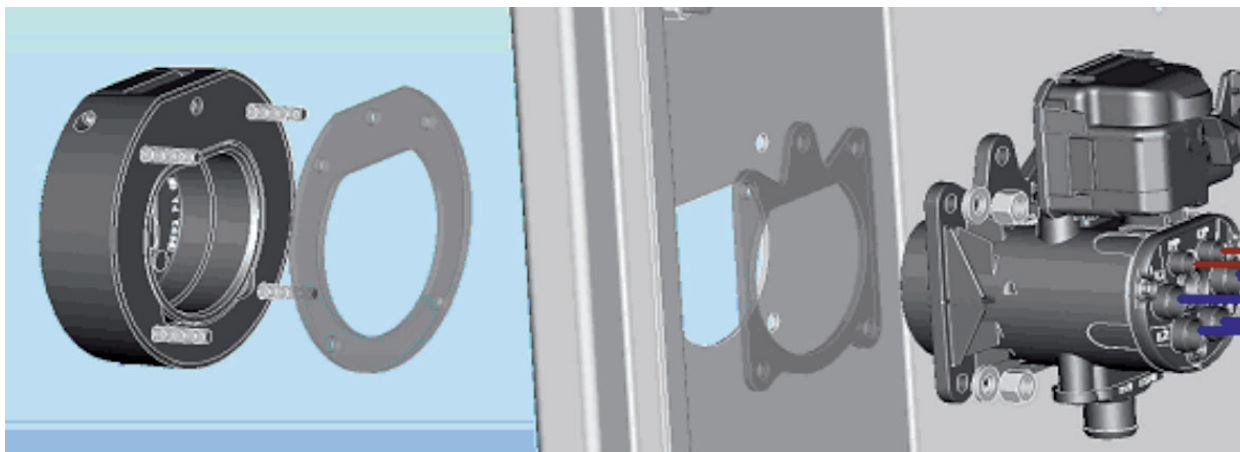


Figure 6: Socket assembly

3. Disconnect the different cables from the broken connector.
4. Replace the socket with the new one and connect the cables again. (Attention: Be sure to connect the cables correctly. See the below figure).

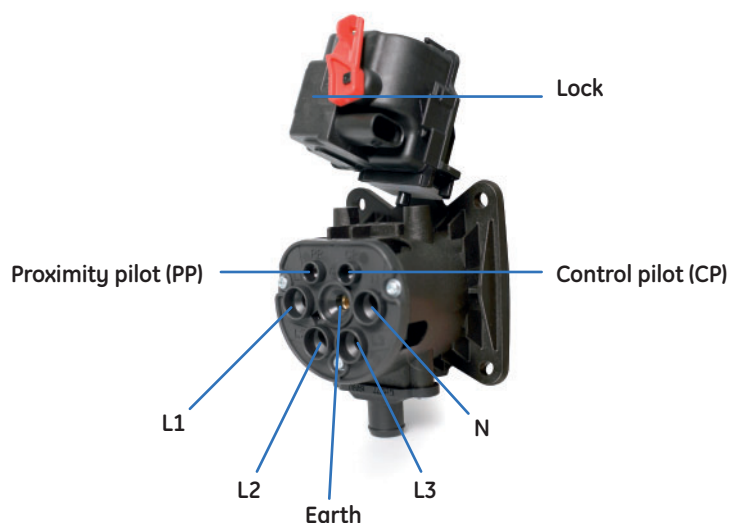


Figure 7: Cables disposition

5. Finally fasten the connector again in the enclosure as indicated in step 2, and install the interlock as in the first step. (Attention: Do not over-tighten. Consider recommended torques in section 3.3. Torque specification),
6. Close the door and lock it.

6.3. LED

Turn the circuit breaker off and verify that no power is applied.

Open the enclosure door with its corresponding key. Remove the door carefully for improved access.

Uninstall the LED assembly from the enclosure as indicated in the following steps:

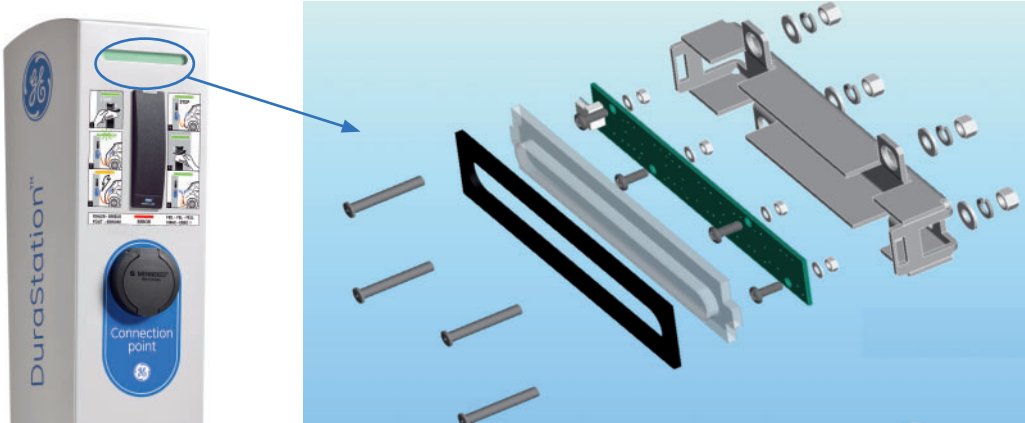


Figure 8: LED assembly

1. Disconnect the LED connector from the controller PCB (J15).

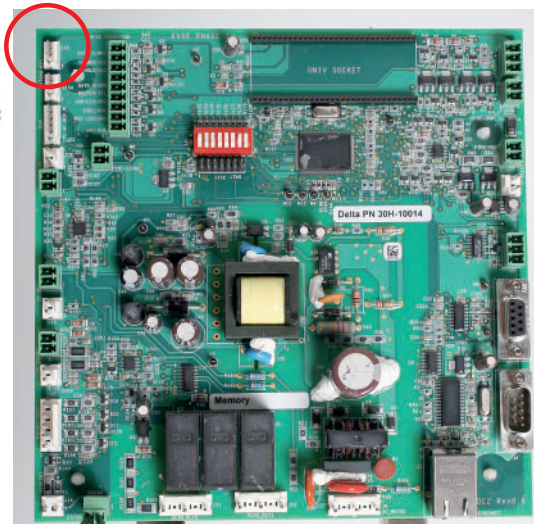
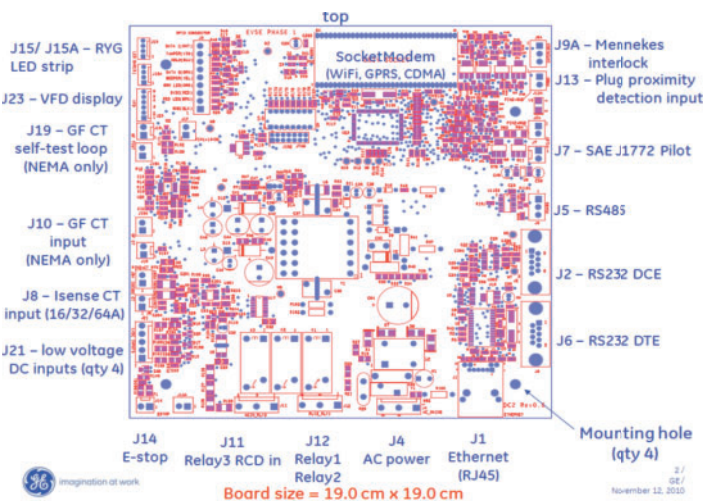


Figure 9: Controller PCB

2. Then, unscrew the four screws located inside the enclosure, that hold the LED metallic support in the charger.

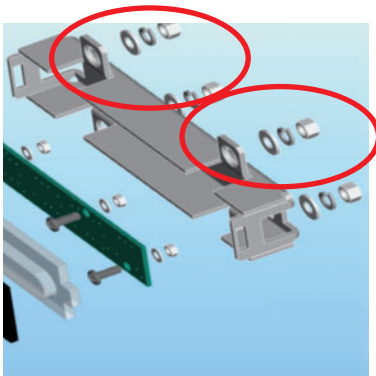


Figure 10: LED assembly

3. Once the LED frame is out of the enclosure. The following steps are applied: The LED strip is included in the frame as shown, secured by internal screws. Replace the LED strip with a new one and secure it in the same way in the given frame.

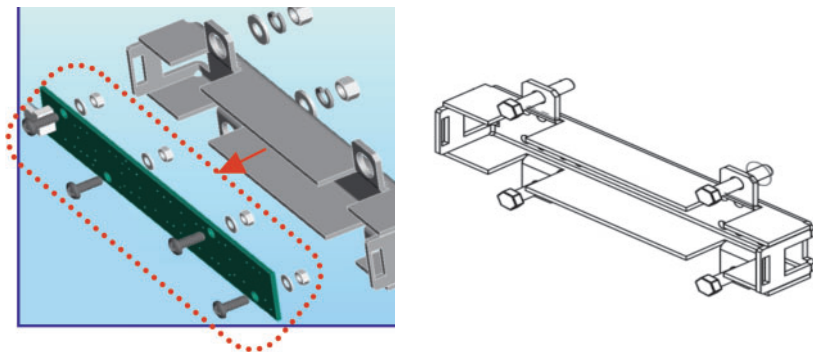
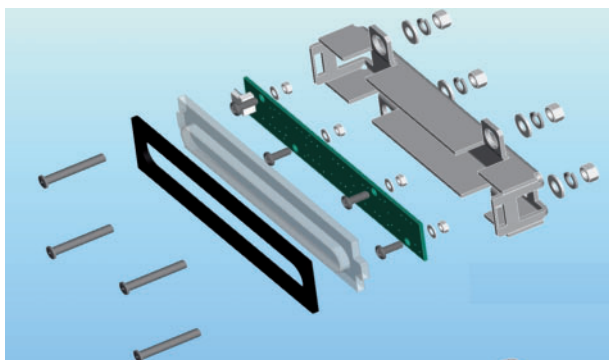


Figure 11: LED metallic support

4. Install the metallic support again into the enclosure as indicated in the following picture.
(Attention: Do not over-tighten. Consider recommended torques noted in section 3.3. Torque specification).



5. Connect again the LED connector to the controller-PCB (J15) as in the first step.
6. Once completed, close and lock the door of the enclosure.

6.4. RFID

Turn the circuit breaker off and verify that no power is applied.

Open the enclosure door with its corresponding key. Remove the door carefully for improved access. Uninstall the RFID assembly from the enclosure as indicated in the following steps:

1. Disconnect the RFID connector from the controller-PCB.

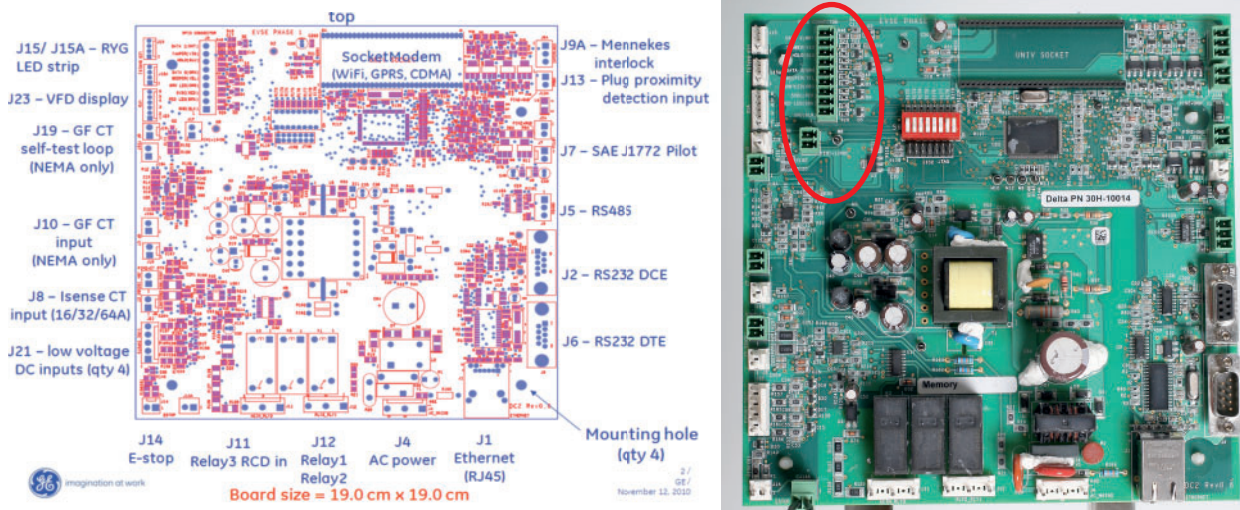
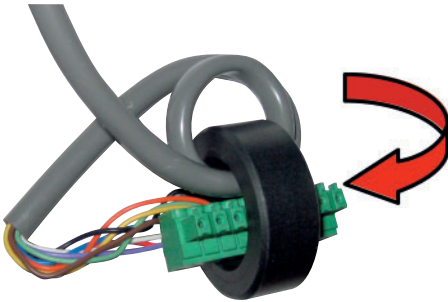


Figure 12: Controller PCB

2. The cable of the card reader includes a ferrite. Remove the ferrite carefully, for that, introduce the connector two times through it as shown.



3. Unscrew the two screws located inside the enclosure, as it is shown in the following picture:

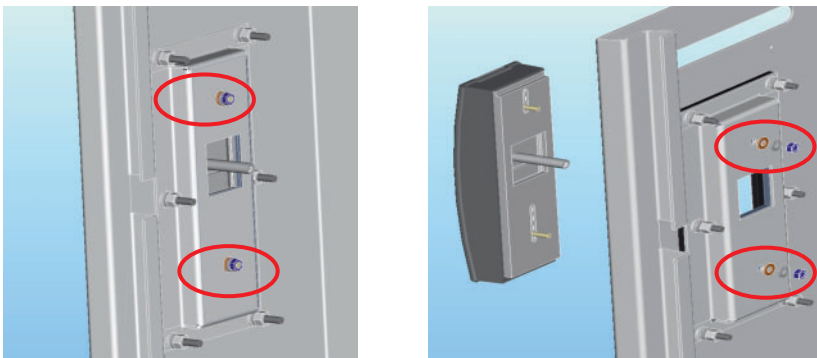
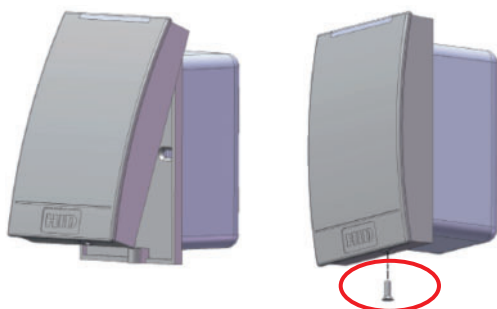


Figure 13: RFID assembly

4. Carefully remove the old RFID reader located in the front of the Durastation.

5. Open the old RFID reader by unscrewing the screw at the bottom, as shown below.



6. In the old RFID reader, remove the internal mounting piece, where two axles are welded, as shown in the following picture.

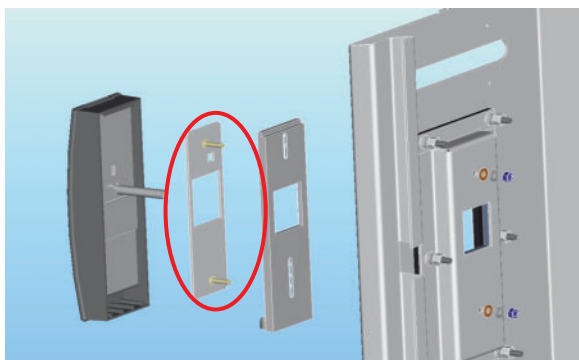


Figure 14: RFID assembly

7. In the same order, place this mounting part in the new RFID sensor and replace the RFID reader in the enclosure.
Attention: The cable of the card reader includes a ferrite. Ensure it is included in the new RFID with 2 turns in the cable as indicated in step 2.
8. Fasten the RFID reader in the enclosure as indicated in the step 1, screwing the two screws inside the enclosure.
(Attention: Do not over-tighten. Consider recommended torques noted in section 3.3. Torque specification).
9. Connect again the RFID connector to the controller-PCB as in the first step.
10. Once completed, close and lock the door of the enclosure.

6.5. Gaskets

Gaskets are easily replaced and do not require the use of specific tools.

The gaskets can be pulled out of the groove in the door and new or clean gaskets can be pressed back into place.

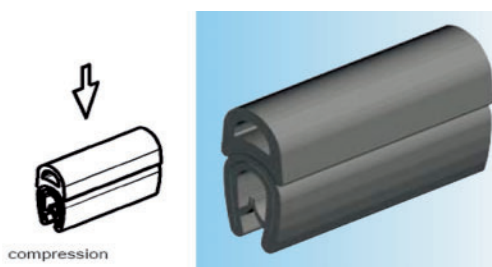


Figure 15: Door gaskets

6.6. Cable Glands and Screw Plugs

Cable Glands

In "Wall mounted" and "Pole mounted" DuraStation versions, the power supply cables are ensured by using cable glands. They are easily replaced as indicated in the following steps:

1. Unscrew the external part of the cable gland, so it is removed completely.



2. Twist the inside part of the cable gland off, until it is removed (cables are loose). Then, remove the internal part that supports the cables.



3. Replace the damaged cable gland by a new one, following the same previous steps.

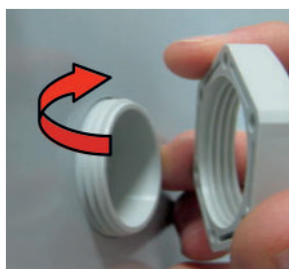
Ensure to center the cables and turn the gland, until there is no possible cable movement.

Screw Plugs

In "Wall mounted" and "Pole mounted" DuraStation versions, if the DuraStation charger is not connected in series with a second DuraStation, a screw plug is used to close the additional outlet in the back side of the DuraStation. Therefore, the appropriate IP protection rating of the system (IP54) is maintained.

As for cable glands, they are easily replaced as indicated in the following steps:

1. Unscrew the external part of the screw plug until it is removed completely.



2. Remove the internal part and replace the screw plug, by a new one, following the same steps.

6.7. EVSE Kiosk

If the EVSE kiosk has suffered external damage, and as such affecting the IP protection rating of the system (IP 54), the following parts of the EVSE kiosk should be inspected for any damage:

- Tampering lock
- Maintenance door

If any of these components have suffered any damage, the maintenance door should be replaced.

- Damage to the inside of the enclosure.

If you have any doubt about the correct IP protection rating in the EVSE kiosk, the entire EVSE kiosk must be replaced.

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